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From the Journal and Proceedings, Asiatic Society of Bengal (New Series), Vol. XIV, 1918, No. 7
Issued 30th August, 1918.

Preliminary Note on the Flora of the Anaimalais.

By C. Fischer, *Indian Forest Service.*

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10. Preliminary Note on the Flora of the Anaimalais.

By C. FISCHER, *Indian Forest Service.*

(Read at the Indian Science Congress, Jan. 1918).

The Anaimalai Hills form the northern mass of a vast stretch of mountain region that occupies a considerable portion of the Travancore and Cochin States and parts of the Madura and Coimbatore Districts in British territory. An offshoot runs southwards to the neighbourhood of Cape Comorin.

The range we are here concerned with falls within the limits of the Coimbatore District. It lies on the border land between Travancore, Cochin and Coimbatore, distinctly nearer the west than the east coast of the Peninsula, and covers a length of about 33 miles from west to east, with a maximum breadth, north to south, of 17 miles.

The range is not everywhere very clearly separated from the Travancore Hills to the south. On the west and east it is cut off from the Neliampatti and Palni hill ranges respectively by the Tekkadi and Amaravati rivers. Its northern limit is formed by steep slopes descending to the plains of Coimbatore.

The elevations along the foot of the hills vary from about 900 feet above mean sea level, where the Amaravati river leaves them on the east, to about 1,200 feet on the west. The highest peak, Tanakumalai, more or less centrally situated, rises to nearly 8,300 feet. From this central mass, where there are a number of prominences over 7,000 feet high, the hills fall away east and west to the valleys of the two rivers mentioned, while southwards, after falling to about 6,500 feet near the Travancore border, the land rises again to culminate at Anaimudi, 8,800 feet, the highest point in Southern India.

The whole tract forms a very wild and rugged region, the greater part of which is totally uninhabited and trackless. The persevering pioneer is rewarded by grandiose aspects of hill, torrent and forest and, at the higher levels, by an invigorating atmosphere. Parts are still practically unknown and have been penetrated only by the jungle-men and a few prospecting or sporting planters and forest officers.

The first visit of a European of which we have any record was made by Captain (afterwards General) J. Michael, the first Forest Officer in the Madras Presidency, if not in India, in 1851. He made two or three trips to the higher range and a high level valley commemorates his name. Captain Douglas Hamilton, another Forest Officer drawn from the then Madras Native Infantry, also explored thes[...]es of the

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last century. Lt. (later Col.) Beddome and Dr. Cleghorn, both Forest Officers, made excursions ; their reports, as well as some sketches of the scenery and the aborigines made by Hamilton, are to be found in Cleghorn's "Forests and Gardens of Southern India."

The first plantations for coffee were started on the northern slopes about the middle of the last century, but the best planting region, which is now the thriving Anaimalai Planting District and which has bitten so deeply into the splendid evergreen forests of the south-western aspects, was opened about 1896 by one or two adventurous pioneers who have reaped a rich and deserved harvest as a result of their enterprise.

As the name of the range indicates to those who know Tamil, the Anaimalais (literally Elephant Hills) are one of the South Indian strongholds of elephants. These beasts are often a serious menace to planters and others in the tract, not only to property but to life. Apart from the capturing operations by the pit method carried out by the Forest Department in the extreme western corner, these animals roam the length and breadth of the hills practically unmolested.

The Indian bison or gaur is common, both in the lower moist forests and on the grassy downs of the heights, where it grazes almost side by side with large herds of the Nilgiri goat—*Hemitragus hylocrius*. Tigers are not very common, the tract as a whole not being very well suited to their habits. The panther is more frequent and black specimens are not uncommon. Other animals of interest to the sportsman are the sloth bear, wild dog, often met with in very large packs, sambar, spotted deer, mouse-deer and wild pig. Small game is not at all abundant.

Among snakes of special interest, I may mention the hamadryad (*Naia bungarus*), a specimen of which, 11½ feet long, was killed within a stone's throw and, incidentally, by a thrown stone, of my camp at Attakatti. At the same place I killed a keeled viper (*Echis carinata*). The fauna as a whole is as varied and as interesting as the flora and as little investigated, so that this tract should prove a rich field for all departments of Zoology.

Four indigenous races of jungle-men reside in these hills. These are the Kadirs, Malasas, Muduvas, and Pulaiyas. The Kadirs are a primitive tribe without fixed location and with practically no cultivation. They construct temporary habitations shifting with the seasons, but confine themselves almost entirely to the evergreen forest region. Their rainy season huts are complete and fairly watertight, though constructed of bamboo and thatched with grass or the leaves of the reed-bamboo, while the fair weather shelter is a mere lean-to, formed by a thatched oblong frame of bamboo inclined

against two bamboo posts and quite open on three sides. These people live mainly on wild roots and fruit, honey, grubs, etc., and, to a certain extent, on food-stuffs obtained from the plains by barter for jungle products, but at a pinch they are quite self-supporting. They are much addicted to opium eating.

The Malasas are a larger and wider spread tribe, much more in contact with the population of the plains and often living alongside of plains villages, where they are employed on field labour.

The Pulaiyas and the Muduvas dwell exclusively in the central and eastern portions of the hills. The latter are said to descend from plains people who took refuge in the hills from the aggression of Tippo Sultan's Muhammadan invaders. They rate themselves as the aristocracy of the hills and are acknowledged as superior by the other tribes and, indeed, occupy the same relative status among them that the Brahmins do among the Hindus. They eat flesh but respect that of the bison, as being of the nature of a cow, a respect in which the Kadirs also share. Neither will touch or even approach a dead bison though they will assist a sportsman in stalking and shooting these fine beasts. The Pulaiyas, on the other hand, show no such scruple and the vicinity of a bison carcase is a repulsive spectacle after these people have got at it.

The only cultivation of the Kadirs is an occasional patch of *Eleusine coracana Gaertn.* in small clearings along the streams. The other races cultivate *Andropogon Sorghum Brot.*, *Eleusine coracana Gaertn.* and *Amaranthus paniculatus Linn.* The Muduvas and Pulaiyas also grow *Ipomaea Batatas Poir*, to a considerable extent, irrigating the fields by channels from the streams. It has been stated that "ganja" (*Cannabis sativa Linn.*) is grown in places in spite of legal prohibition, but I have never seen any sign of it, nor have the excise officers ever obtained confirmation of the rumour.

The earliest records of botanical investigation in the Anaimalais are found in the reports of Captain Michael, Lt. Beddome and Dr. Cleghorn, which have already been referred to. These accounts of their visits, however, were inspired rather by the zeal of pioneer foresters than of botanical investigators, and the information from the latter point of view is scanty and indefinite. Beddome was in charge of these forests and though no separate work on the area is forthcoming his observations are to be found in his "Flora sylvatica," "Ferns of Southern India" and "Ferns of British India."

I have not been able to ascertain whether Dr. Robert Wight, who was stationed for a considerable time in Coimbatore, ever visited the Anaimalais, but it would seem that he did not, since the region is not referred to in his and Arnott's

"Prodromus"; the hills mentioned in that work belong to a quite different range.

Dr. C. A. Barber, as Botanist to the Government of Madras, paid two or three visits to the Anaimalais and field collectors of that office have been deputed to collect there. By the courtesy of Rai Bahadur K. Ranga Chariar and his assistants I have been furnished with a list of the plants collected and noted during these trips.

My own acquaintance with these hills covers a period of about five years from the end of 1911, during which time my official duties took me into these hills for at least one half of each year. Unfortunately, the exigencies of forest work demanded my presence in definite localities at the same periods each year, so that my collections and notes are deficient in consequence. This has affected my record of the most interesting and fruitful localities, that is to say, the dense evergreen forests and the grass lands of the mountain tops, which I was able to probe only during the hot weather months.

Considered as a whole, the flora of the range partakes both of the Malabar and the Dekkan regions as described in Sir Joseph Hooker's "Sketch of the Flora of British India." The Malabar region is represented in the evergreen forests and their neighbourhood in the zones of heavy rainfall. The Coromandel sub-region of the Dekkan region is found in the comparatively low-lying tract near the Amaravati river; and the Mysore sub-region on the outer, fairly dry slopes up to about 1,500 feet, especially towards the east.

The vegetation falls naturally into five fairly distinct types, though they are intermingled to a certain extent and merge so that no very clear limits can be assigned to each.

Starting from the plains we get successively :—

I. *The dry semi-desert type* which occupies the lower Amaravati valley and extends westwards more or less along the foot of the hills. The elevations run from about 900 to 1,500 feet and the rainfall ranges from 18 to 21 inches.

As might be expected, thorny plants figure prominently : such as *Commiphora Berryi Engl.*, *Dichrostachys cinerea W. & A.*, *Acacia Latronum Willd.* (generally very gregarious), a sprinkling of *Acacia planifrons W. & A.*, *Opuntia Dillenii Haw.*, *Coffea Wightiana W. & A.*, *Dicoma tomentosa Cass.*, *Azima tetracantha Lam.*, *Solanum trilobatum Linn.*, *Euphorbia antiquorum Linn*, and *tortilis Rottl.* Other characteristic plants are *Euphorbia dracunculoides Lam.*, and *Jatropha Wightiana Muell.-Arg.* and among grasses *Perotis latifolia Ait.*, and *Oropetium Thomaeum Trin.*

Along the large streams species of other types are apt to intrude, as *Terminalia Arjuna W. & A.*, *Vitex leucoxylon Linn. f.*, *Albizzia procera Benth.*, *Hopea parviflora Bedd.*, *Calophyllum Wightianum Wall.* and *Calamus pseudotenuis Becc.*

II. *The dry deciduous hill type* is found on the outer slopes from 1,500 to 3,500 feet with a rainfall of from 20 to 60 inches. The slopes are generally very rocky and precipitous.

The characteristic species here are *Cochlospermum Gossypium D.C., Shorea Talura Roxb., Sterculia urens Roxb., Eriolaena quinquelocularis Wight, Buettneria herbacea Roxb., Plectronia didyma Gaertn., Diospyros montana Roxb., Didymocarpus Rottleriana Wall., Givotia rottleriformis Griff.*

III. *The moist deciduous forest type,* mainly situated in the western extremity, though it occurs also in patches here and there in favourable localities. It ranges between elevations of 1,500 and 2,500 feet with a rainfall of from 50 to 100 inches and merges into the evergreen type. This is the most important type in the estimation of the forest officer, for it is here that the finest timber trees are found and where they attain their greatest development. Here we find enormous stems of *Tectona grandis Linn., Dalbergia latifolia Roxb., Terminalia tomentosa Bedd., Anogeissus latifolia Wall., Pterocarpus Marsupium Roxb., Lagerstroemia lanceolata Wall.,* and several others.

Apart from these giant trees two other features distinguish this type : the luxuriant growth of *Bambusa arundinacea Willd.,* which tends to take possession of the soil to the exclusion of all other vegetation, and the presence of *Lantana Camara Linn.,* which rapidly overgrows open spaces.

Other noteworthy species are *Dillenia pentagyna Roxb., Naregamia alata W. & A., Vitis discolor Dalz., Crotolaria dubia Grah.,* several species of *Desmodium, Spatholobus Roxburghii Benth., Careya arborea Roxb., Antidesma Ghaesembila Gaertn., Cycas circinalis Linn.,* a number of *Scitaminaceæ,* including *Zinziber officinalis Rosc.* and *Clinogyne virgata Benth.,* which forms dense thickets near water. The fern *Drynaria quercifolia Linn.* is common on tree trunks and on rocks.

The depressions are often swampy and there one finds *Randia uliginosa D.C., Sphenoclea zeylanica Gaertn., Hydrolea zeylanica Vahl.,* and *Ceratopteris thalictroides Linn.* Along streams *Rhabdia lycioides Mast.* occurs.

IV. *The evergreen type,* which is divisible into three sub-types corresponding roughly with the elevation, and where a rainfall of from 100 to 150 inches prevails.

(*a*) *The low evergreen sub-type* lies between 1,500 and 3,000 feet. Some of its characteristic species are :—

Hydnocarpus Wightiana Bl., Xanthophyllum flavescens Roxb., Geophila reniformis Don, Bragantia Wallichii Br., Croton candatus Giesel, Dimorphocalyx Lawianus Hook. f., Excaecaria robusta Hook. f., and the reed-like bamboo *Ochlandra travancarica Benth.,* which densely covers large areas along streams. It is the leaves of this species that are generally used for thatching.

(*b*) *The median evergreen sub-type* from 3,000 to 5,000 feet. This is the zone most suited for the purposes of the planting industry and several thousand acres have been cleared for coffee, tea and cardamoms. Rubber trees of several kinds have been tried, but this cultivation has not proved as profitable as that of the other products named. Pepper vines are also grown to a small extent on the shade trees in the plantations.

Gigantic evergreen trees grow in these forests, some, such as *Mesua ferrea Linn.*, *Calophyllum tomentosum Wight*, *Palaquium ellipticum Engl.*, and *Diospyros Ebenum Koen.*, are of value to the timber trade. This is probably the most varied and botanically interesting of all the types and covers a very large expanse. The vegetation is exceedingly dense and it is possible to walk for miles in unclouded day light without being able to catch a glimpse of the sun, so much so that surveyors working here have to dispense with sun readings.

There are four well defined stories of vegetation: tall trees, with their crowns out in the sunlight, overtop all; besides those already named may be mentioned *Cullenia excelsa Wight*, *Elæocarpus tuberculatus Roxb.*, *Canarium Strictum Roxb.*, *Kurrimia bipartita Law.*, and several species of *Myristica*.

Beneath these, smaller trees adapt themselves to the more shady conditions and form a lower story consisting, among very many more, of *Unona pannosa Dalz.*, *Goniothalamus Wightii Hook, f. & T.*, several *Garcinias*, *Holigarna Beddomei Hook, f.*, *Eugenia Munronii Wight*, *Premna coriacea Clarke*, *Agrostistachys longifolia Benth.* and *Macaranga tomentosa Wight.* The latter with *Clerodendron infortunatum Linn.* being the first tree-growth to appear as secondary growth on cleared areas left to themselves.

Innumerable woody shrubs form the next stage, such as *Paramignya armata Oliv.*, *Turraea villosa Benn.*, *Psychotria anamallayana Bedd.*, *Saprosma indicum Dalz.*, *Ervatamia coronaria Stapf*, several *Strobilanthes* which are often overgrown by *Cassytha filiformis Linn.*, and *Elettaria cardamomum Maton.*

Finally, below all, there is a carpet of herbs, and cryptogams like *Neurocalyx Wightii Arn.*, *Acranthera anamallica Bedd.*, *Pellionia Heyneana Wedd.*, *Gymnopteris contaminans Wall.* and *Selaginella plumosa Baker.* Orchids and ferns cluster on the trunks, mosses clothe them and lichens disguise them; an occasional *Fagraea ovata Wall.* or *Connarus Wightii Hook, f.*, is festooned among the branches.

Where the soil is poor the trees of the tallest story are either absent or reduced in size and there are then only three stories; here the tree composite, *Vernonia monosis Benth.*, appears.

Some further features of interest in this sub-type are the tree ferns (species of *Alsophila*), the *Podostemoniaceae*

on semi-submerged rocks in stream beds, the occurrence of the justly-dreaded "elephant-nettle," *Laportea crenulata Gaud.*, and of the only South Indian conifer *Podocarpus latifolia Wall.*, though this latter is rare in the tract.

(c) *The high evergreen sub-type* above 5,000 feet. This type occurs both in continuous expanses of forest and in isolated patches punctuating the open grass lands of the next type, usually aggregating in and around depressions which form the sources of streams.

Here we find *Michelia nilagirica Zenk.*, *Mahonia Leschenaultii Tak.*, *Eurya japonica Thunb.*, *Elæocarpus ferrugineus Wight*, three species of *Ilex*, three species of *Microtropis*, *Turpinia pomifera D.C.*, three species of *Rubus* (mainly in open glades and along the borders), *Rhodomyrtus tomentosa Wight*, *Eugenia calophyllifolia Wight*, *Senecio Carymbosa Wall.*, *Gaultheria fragrantissima Wall.*, *Rhododendron arboreum Sm.*, *Ardisia rhomboidea Wight.*, *Symplocos anamallayana Bedd.*, *Cinamomum Wightii Meissn.*, *Cirrhopetatum Gamblei Hook, f.*

The curious epiphyte *Impatiens Jerdoniæ Wight* is common at the higher elevations, as also the small parasite *Viscum japonicum Thunb.*, especially on *Eurya japonicum* and *Rhododendron arboreum.*

V. *The grass land type* from 3,500 feet to the highest summits. Here again a sub-division according to elevation is required. The limits between the sub-types is not well defined, but can be fixed with rough approximation at 6,000 feet. The type consists of open grass lands; the lower sub-type is often dotted with single trees or small groups, such as *Terminalia Chebula Retz*, *Zizyphus rugosa Lam.*, *Mallotus albus Muell.-Arg.*, while the higher sub-type is invaded by the patches of the high level sub-type of the evergreen type. The slopes are usually steep except where small plateaus occur, when the ground undulates more or less gently to the edge of precipices or passes more gradually into the steeper, lower slopes.

(a) *The lower grass-land sub-type* below 6,000 feet presents such species as *Berberis tinctoria Lesch.*, three species of *Viola*, *Crotolaria Wightiana Br.*, *Desmodium rufescens D.C.*, *Drosera Burmannii Vahl*, *Lobelia nicotianaefolia Heyne*, *Swertia affinis Clarke*, *Æginetia pedunculata Wall.*, *Osyris arborea Wall.*, three species of *Burmannia*, *Phoenix humilis Royle*, *Eriocaulon odoratum Dalz.*, *Ischaemum ciliare Retz*, *Andropogon Nardus Linn.*, *Pteris aquilina Linn.*, *Lycopodium cernuum Linn.*, and *Selaginella rupestris Spreng.* on rocks.

(b) *The high grass-land sub-type* above 6,000 feet offers a number of species of an alpine affinity and generally resembles the flora of at the same elevations in the Nilgiri and Palni Hills. The species met with chiefly are *Hypericum japonicum Thunb.*, *Geranium nepalense Sweet*, *Fragaria indica And.*, *Osbeckia Leschenaultii D.C.*, *Peucedanum anamallayanum C. B.*

Clarke, Hedyotis articularis Br., and *buxifolia Bedd.*, *Dipsacus Leschenaultii Coult.*, *Vernonia Bourneana W. W. Smith*, *Anaphalis araneosa D.C.*, *Cnicus Wallichii D.C.*, *Lysimachia Leschenaultii Duby*, *Pedicularis zeylanica Benth.*, *Strobilanthes Kunthianus T. And.*, *Plantago major Linn.*, *Rumex nepalensis Spreng.*, *Thesium Wightianum Wall.*, *Lilium neilgherrense Wight*, *Isachne Gardneri Benth.*, *Arundinella Wightiana Nees.*

In swampy places occur *Ranunculus reniformis Wall.* and *Wallichianus W. & A.*, *Drosera peltata Sm.*, *Serpicula indica Thw.*, *Gentiana quadrifaria Bl.*, several *Utricularias*, *Satyrium nepalense Don.*, several species of *Eriocaulon*, *Carex phacota Spreng.*, and *Athyrium Filix-fœmina Bernh.* Along streams are *Anemone rivularis Ham.*, *Impatiens Tangachee Bedd.* (named after a prominent peak of these hills), the beautiful *Sonerila grandiflora Wall.*, and *Exacum atropurpureum Bedd.*, var. *anamallayanum Bedd.*, also *Arundinaria Wightiana Nees* and *Osmunda regalis Linn.*

It will be seen, therefore, that the flora of this range is very varied but, on the whole, does not differ very widely from that of adjoining areas. As far as present investigation extends the chief points of difference that present themselves are the following :—

The absence from the semi-desert type of the spinous *Dalbergias* and of *Cassia marginata Roxb.*, which are common in the Madura District.

In the evergreen forests one expects the *Anacardiaceae* and *Guttiferae* to be more fully represented than they seem to be.

In the higher grass lands *Cotoneaster buxifolia Wall.*, *Rosa Leschenaultii W. & A.* and *Parochetus communis Ham.*, all three common in similar tracts in the Nilgiris and Palnis, are entirely absent as far as my observations go. On the other hand, we find *Anaphalis Meeboldii W. W. Smith* exceedingly common on the Tanakumalai ridge, and lower down *Impatiens herbicola Hook, f.*, both of which were first discovered by Meebold in Travancore and have been reported so far from nowhere else.

In the median evergreen sub-type, or on grass land near its borders, *Podocarpus latifolia Wall.* is found, though uncommon. This conifer elsewhere has been seen only in the Tinnevelli and Travancore hills far to the south.

Another uncommon plant of these hills is *Utleria salicifolia Bedd.* Of recent years it has been found in another range of Coimbatore hills. It is a gregarious shrub, not a tree as stated in the "Flora of British India," growing in rocky places at an elevation of 4,000 to 5,000 feet and attaining a height not exceeding 6 feet with a basal diameter of $1\frac{1}{2}$ inches.

Pyrenacantha volubilis Hook., a slender climber apparently unreported from India up to the time Vol. I of the "Flora of

British India" was published in 1875, and since reported only from the Palni and Tinnevelli hills (*vide* Gamble's "Flora of the Presidency of Madras") occurs in the semi-desert type of our area. It may be of interest to note that I have recently found this species in the northern part of the Nellore District, at least 350 miles north of the Anaimalais.

From all sources, including those already alluded to, I have drawn out a list of 1,805 species, exclusive of fungi, as occurring in the Anaimalai range. It is certain that this list is far from complete, for the published works bearing on this tract include the whole of the Madras Presidency, and it is not always possible to ascertain whether any particular species has been found there when these hills are not specifically named as an habitat. I have thought it best to omit any species not definitely noted as having been observed in these hills.

Of the 1,805 species listed, exactly 1,500 find place in my own notes. The main deficiencies are probably among the *Orchidaceae*, *Eriocaulaceae*, *Cyperaceae*, *Graminaceae* and *Cryptogams*. The final list is not likely to fall short of 2,200.

Of the 1,805 species recorded at present, 1,661 are *Phanerogams* and only 144 are *Cryptogams*. The *Monocotyledons* number 214 and the *Gymnosperms* only three, namely: *Gnetum scandens Roxb.*, *Podocarpus latifolia Wall.*, and *Cycas circinalis Linn.*

There are 13 orders represented by 30 or more species, headed by the *Leguminosae* with 163; no others have as many as 100, *Euphorbiaceae* being second with 91.

Nineteen genera are represented by 10 or more species, headed by *Crotoloria* with 29 and *Impatiens* with 26, the rest all falling below 20.

Synoptical Table.

Division.	No. of natural orders.	No. of genera.	No. of species.
I. Phanerogamia ..	140	765	1661
A. Dicotyledones ..	116	640	1444
1. Polypetalae ..	63	286	650
(*a*) Thalamiflorae ..	22	81	179
(*b*) Disciflorae ..	18	94	178
(*c*) Calcyciflorae ..	23	111	293
2. Gamopetalae ..	33	253	546
3. Monochlamydeae ..	20	101	248
B. Gymnospermae ..	3	3	3
C. Monocotyledones ..	21	122	214
II. Cryptogamia ..	4	66	144
TOTAL ..	144	831	1,805

Orders with over 30 *Species.*

No.	Order	Species
1.	Leguminosae	163
2.	Euphorbiaceae	91
3.	Rubiaceae	70
4.	Compositae	67 (bracketed with 5)
5.	Acanthaceae	67 (bracketed with 4)
6.	Graminaceae	58
7.	Urticaceae	50
8.	Labiatae	44
9.	Orchidaceae	42
10.	Scrophulariaceae	39
11.	Malvaceae	32 (bracketed with 12)
12.	Convolvulaceae	32 (bracketed with 11)
13.	Asclepiadaceae	31

Genera with 10 *or more Species.*

No.	Genus	Species
1.	Crotolaria	29
2.	Impatiens	26
3.	Ficus	17 (bracketed 3–4)
4.	Ipomoea	17 (bracketed 3–4)
5.	Indigofera	15 (bracketed 5–7)
6.	Diospyros	15 (bracketed 5–7)
7.	Asplenium	15 (bracketed 5–7)
8.	Eugenia	14 (bracketed 8–9)
9.	Strobilanthes	14 (bracketed 8–9)
10.	Desmodium	13
11.	Hibiscus	12 (bracketed 11–15)
12.	Vitis	12 (bracketed 11–15)
13.	Grewia	12 (bracketed 11–15)
14.	Loranthus	12 (bracketed 11–15)
15.	Habenaria	12 (bracketed 11–15)
16.	Osbeckia	11
17.	Blumea	10 (bracketed 17–19)
18.	Leucas	10 (bracketed 17–19)
19.	Euphorbia	10 (bracketed 17–19)

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